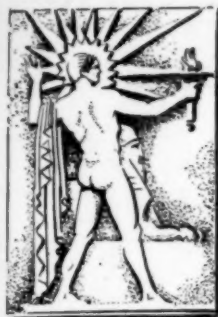


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SCIENCE NEWS-LETTER

The Weekly Summary of Current Science
A SCIENCE SERVICE PUBLICATION

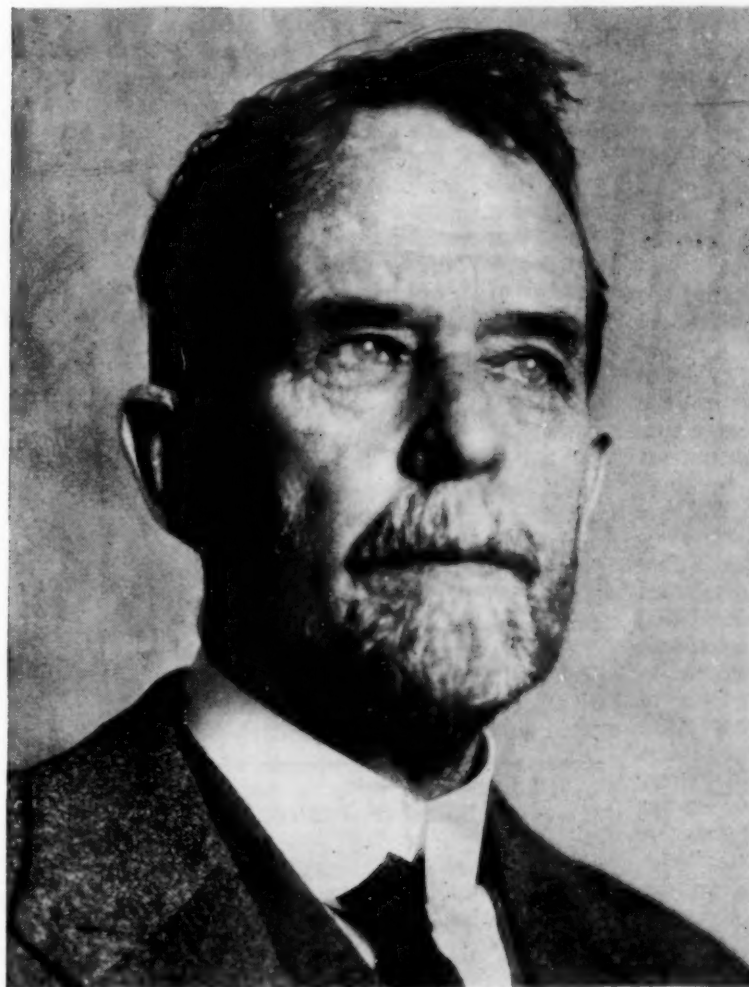


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15c a copy



January 11, 1930.



THOMAS HUNT MORGAN

*Newly Elected President of American Association
for the Advancement of Science*

(See page 23)

Vol. XVII

LIII

No. 457

WJZ

Sub-Atomic Energy and "Science Sins"

Physics

War, Peace, Food, and Physics Complexities Discussed

THE world need have no fear that some scientist probing into the atom will let loose enormous stores of sub-atomic energy and blow the earth to star-dust. For Dr. Robert A. Millikan, California physicist and Nobel prizeman, president of the American Association for the Advancement of Science, at its recent meeting dispelled this dire hobgoblin once seriously believed by physicists but now shown to be a mere nightmare when viewed in the light of modern theories of matter.

So widespread had become the belief that dangerous quantities of energy are locked in the atom to be released by a little more scientific knowledge that solemn churchmen called for a complete cessation of scientific research for fear some bad boy scientist might use the hypothetical power for evil ends. A current drama, "Wings Over Europe," pictured the British Cabinet bowing before a young physicist who unlocked the atom.

Declaring that the "new evidence born of scientific studies is to the effect that it is highly improbable that there is any appreciable amount of available sub-atomic energy for man to tap," Dr. Millikan said that we "may go home and henceforth sleep in peace with the consciousness that the creator has put some foolproof elements into His handiwork and that man is powerless to do it any titanic physical damage."

Answering a second alleged sin of science, that science has made war more deadly, more horrible and less heroic, Dr. Millikan said that "every scientific advance finds ten times as many new, peaceful, and constructive uses as it finds destructive ones."

"Explosives and fertilizers are basically the same," he said, "and even explosives find a dozen peaceful uses to one warlike one. Public thinking is misled by the fact that a horror makes better news than a wheat crop. One man blown painlessly to atoms

gets more news space than a thousand men dying by inches from disease. Steel does indeed make bayonets, but it also makes plowshares and railroads and automobiles and sewing machines and threshers and a thousand other things whose uses constitute the strongest existing diverter of human energies from the destructive to the peaceful arts. In my judgment, war is now in the process of being abolished chiefly by this relentless advance in science, its most powerful enemy."

Maintenance of a balance between future population and food supply was called by Dr. Millikan "mankind's greatest problem." He called upon the fullest stimulation of both the biological and physical sciences to solve this critical situation facing civilization.

The complete text of Dr. Millikan's address will appear in the February number of *Scribner's*.

THE scientifically inclined layman who feels bewildered at the host of new physical conceptions that have been brought forward in recent years, can now have the consolation that he is not alone in such feeling. Speaking as vice-president of the physics section of the American Association for the Advancement of Science, Dr. P. W. Bridgman, of Harvard University, admitted a similar sensation.

"Many of us could, I believe," he declared to the physicists, "confess to a feeling of breathlessness at the rapid changes of our present physical

progress and some of us might even, in a moment of candor, admit a little resentment at our shortness of breath."

Some of the important landmarks in the progression of physical knowledge he listed as follows: the electromagnetic theory of light, the special theory of relativity, the general theory of relativity, the quantum theory of Bohr, the matrix calculus of Heisenberg, the wave mechanics of Schrödinger, the transformation theory of Jordan and Dirac, the group theory of Weyl, and, finally the double quantization theory of Jordan and others.

However, Dr. Bridgman said, such changes and new ideas in rapid succession are to be expected, for "when we extend the domain of experiment we must be prepared for unexpected new facts."

In order to be better prepared for such changes in the future, he suggested that physicists abandon the quest for what is called "reality".

"We used to demand that the ultimate goal of physical theories should be nothing less than the discovery of the underlying realities," he said. "Today our demand for reality is much less insistent, in large part because we are much less confident that the ultimate reality, which we thought to be our goal, has any meaning. The meaning to be attached to reality is to a large extent a personal matter, and changes with time, but I believe it is fair to say that the sense in which every one used reality a few years ago and the sense in which the majority use it today has 'uniqueness' as a minimum connotation. It would not have been admitted that two entirely different explanations of the universe could be equally real, but today we see that uniqueness in an explanation is an impossible ideal, and the quest for reality in so far as reality connotes uniqueness, must be abandoned as a meaningless quest."

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SCIENCE NEWS-LETTER, The Weekly Summary of Current Science. Published by Science Service, Inc., the Institution for the Popularization of Science organized under the auspices of the National Academy of Sciences, the National Research Council and the American Association for the Advancement of Science.

Edited by Watson Davis.

Publication Office, 1918 Harford Ave., Baltimore, Md. Editorial and Executive Office, 21st and B Sts., N. W., Washington, D. C. Address

all communications to Washington, D. C. Cable address: Scienserve, Washington.

Entered as second class matter October 1, 1926, at the postoffice at Baltimore, Md., under the act of March 3, 1879. Established in mimeographed form March 13, 1922. Title registered as trade-mark, U. S. Patent Office.

Subscription rate—\$5.00 a year postpaid. 15 cent a copy. Ten or more copies to same address, 5 cents a copy. Special reduced subscription rates are available to members of the American Association for the Advancement of Science.

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Proof Protons Act Like Waves Wins Physicist

A. A. A. S. \$1,000 Prize

Physics

Prof. Arthur H. Compton (left) who was awarded the Nobel prize for showing that X-rays have some of the properties of particles of matter, congratulates his University of Chicago colleague, Prof. A. J. Dempster (right), honored by the A. A. A. S. for showing protons act like waves.

For demonstrating that atoms act like waves of light and thus strengthening the experimental proof of the new kind of physics known as wave mechanics, Prof. A. J. Dempster of the University of Chicago was awarded the \$1000 prize of the American Association for the Advancement of Science for a noteworthy contribution to science presented during the annual science meetings.

Prof. Dempster's researches are an extension of the new physical concepts which last fall won for Prince de Broglie, eminent French scientist, the Nobel prize in physics.

It was once believed that matter and radiation, such as light, had different kinds of properties, but de Broglie's wave mechanics predicted that small particles of matter should behave like waves of light in many respects. This revolutionary idea was first given experimental support by Dr. C. J. Davisson and L. H. Germer, New York physicists, about two years ago when they showed that electrons, particles of electricity and the most minute matter, are deflected from a crystal of nickel as though they were waves instead of particles. Dr. Davisson was honored with a National Academy of Sciences gold medal for his research.

Now Prof. Dempster in his prize paper delivered before the American Physical Society showed that atoms,

larger particles of matter than electrons, also act like waves when they are deflected from a crystal in much the same way that sunlight is reflected from a finely ruled diffraction grating, to make a glorious rainbow. A firmer foundation is provided for the new ideas of the constitution of matter.

A stream of canal rays, charged hearts or nuclei of hydrogen atoms, also called protons, speeding 1500 miles a second at a potential of 30,000 volts, were used by Prof. Dempster in his experiments. These were projected against a crystal of calcite with the experimental result that the atomic hearts were shown to act like waves instead of particles of matter.

Since the hydrogen atom's heart is 1843 times as massive as the electron and since the larger the particle of matter the less it acts like a wave, Prof. Dempster's achievement is hailed as a considerable advance.

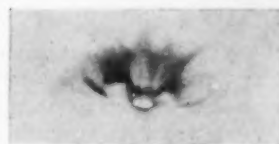
Proof of the wavelikeness of atoms was also presented, by an unusual coincidence, on the same program of the physicists by a German, Prof. Otto Stern of Hamburg. He obtained results like those of Prof. Dempster through the use of another method. Slower hydrogen particles were used and the crystal used was lithium fluoride. Two University of Iowa physicists, Drs. Harold A. Zahl and A. Ellett, reported similar

reflections of zinc and cadmium atoms from crystals that lend further support to wave mechanics.

Prof. Arthur H. Compton, Nobel prize winner in physics, when asked to comment on Prof. Dempster's work said:

"The most important contribution of twentieth century physics has been the discovery that the physical world is composed of three kinds of particles—protons, electrons and photons, and that each of these particles has also the characteristics of waves. The last stage of this work is the proof that protons, the positively charged parts of matter, have wave characteristics. It is this completion of the great work of twentieth century experimental physics which has been accomplished by Prof. Dempster's discovery of the diffraction of protons by crystals."

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Fan-like impression made on photographic plate by speeding protons deflected like waves from a calcite crystal. Photograph by Prof. A. J. Dempster, reproduced same size as his experimental plates.



Skull of an unhappy Indian of San Nicolas Island, who had pyorrhea and abscesses and rheumatic joints.

Future of Teeth Predicted From Study of Past

Paleopathology

By Emily C. Davis

What are our teeth coming to? The opinion is often gloomily expressed that evolution is insidiously at work on our grinding and chewing tools and that the faces of the future will be very different from the faces of today.

We know that a part of the body that is no longer used has a tendency to disappear: Witness the well-known case of the ancient little horses that ran on tiptoe until in the course of milleniums their four or five toed feet had only three toes and finally each foot had only a single stiff toe or, as we call it, a hoof.

With such warnings from the past in mind it has been predicted that eventually men will have poor, ineffective teeth and finally none at all. Diseased teeth are now a commonplace among civilized men; and the modern diet contains so large a proportion of soft, sweet, and cooked foods that the teeth get no strenuous setting-up exercises and have to combat unfavorable chemical conditions. When a tooth gets a low efficiency rating from the dentist, out it comes, in goes a synthetic tooth, and we apparently get along just as if nothing had happened.

So, it is sometimes argued that the next age of man will be the toothless age. The vision of that future human type shows a creature with a specialized, horny gum good enough for dealing with the pills and pastes and liquids which the food chemists of that day will provide as a balanced diet. We may well shudder to imagine the mumbled speech and the

unbeautiful faces of that toothless race.

But a more reassuring picture of the future is seen by one well known scientist who has taken a long look into the past. By tracing the panorama of toothaches in the prehistory of the world for millions of years, he gauges the direction in which the world's creatures are traveling, so far as dental evolution is concerned. He has scrutinized the fossil teeth in early beasts from fishes and dinosaurs to sabre-tooth tigers and horses, and in early men from Egyptians to Indians. This scientist is Dr. Roy L. Moodie, professor of dental research at the University of Southern California and an authority on paleopathology, or, in words of two syllables, the study of disease as shown in fossil bones.

Dr. Moodie takes a cheerful view of man's future in spite of the fact that thousands of people are wearing artificial teeth where the natural tools ought to be; in spite of the serious prevalence of defective teeth among school children; and in spite of the fact that pyorrhea, which causes the teeth to loosen in their sockets, appears to be more prevalent than ever before.

Pyorrhea, which is today the most widespread of all diseases, was the world's oldest disease, Dr. Moodie has found. It is a disease in which chemical action causes erosion of the edges of the tooth sockets. Bacteria invade the sockets and the teeth loosen and fall out.

Now, fossil skulls examined by Dr.

Moodie show that this process took place in the mouths of ancient fishes in the ages before there were any birds or mammals on earth. The dinosaurs and the water-dwelling lizards, the mosasaurs, suffered from the same disease in the Age of Reptiles, millions of years ago. Mammals of many kinds, when they appeared on earth, inherited this wasting process. Bones of old camels and the mighty elephant-like mastodons show it. The sabre-tooth tigers had it, and the cave bears. All types of ancient and fossil races of man exhibit traces of the same trouble.

The prehistoric inhabitants of Hawaii as represented by their skulls and bones preserved in the Bishop Museum at Honolulu are known to have suffered from diseases of the teeth and particularly from pyorrhea.

But, on the whole, Dr. Moodie finds that no human race in the past suffered from tooth troubles as did the Indians who inhabited Peru in the centuries before white men came to America. These were the tribes which finally were bound together into the great Incan Empire, when a comparatively small group of Incas, or nobles, set out in a determined campaign of conquest. These Peruvian Indians were more direfully afflicted with dental troubles than the ancient Egyptians whose diseases have been studied with special care.

Like the Egyptians, the Peruvians bound their dead in many wrappings, and when the bundles were put away in dry caves in the highlands or in the desert sand of the Peruvian coast, the climate preserved the bones in good condition. Many of these packages have been opened and examined by scientists seeking to know the types of anatomy of the prehistoric Indians and the diseases and

wounds which left traces in their skeletons. Other mummy packs have been examined by the keen eye of the X-ray which looks through the many layers of cloth and photographs the skeleton within.

Dr. Moodie has examined many of the bones of these Indians.

"A large percentage of the inhabitants lost all of their teeth by middle age from pyorrhea and abscesses," he says. "Hundreds of palates were found wholly without teeth, but bearing the marks of active disease."

The Indians of Peru did not suffer as much from decayed teeth as modern America does, but abscesses starting in the socket of a tooth often penetrated into the head, producing infection in the sinuses which broke through into the eye cavity and into the middle ear. This would have resulted in a high percentage of deafness.

We thus have the dental history of an ancient people which suffered excessively so that those with low grade teeth were soon eliminated, Dr. Moodie concludes. But nothing radical has happened to the dental anatomy of South American Indians. Among the modern inhabitants of the same region in the Andes Mountains may be found the descendants of the earlier population, though there has been some intermingling of races. And these people show no sign of startling dental deterioration.

"If the Andeans retain functional teeth after generations of excessive disease, we may look forward to a long continued functioning of our own teeth" is the moral Dr. Moodie reads in their experience.

There may be a different kind of warning, however, in the example of those Indians. The poison from dental infections draining into the systems of individuals was a weakening factor which may have seriously impaired the political welfare of the tribes, Dr. Moodie suggests.

Pointing out a hard palate of an Indian who lost all his teeth before the age of thirty-five and who would have surely lost strength from improperly chewed food, the paleontologist proposes the theory that such conditions as this among the tribes of Peru may have aided the Incas in subduing entire tribes and city-states. Thus tooth defects may have been a determining factor in the establishment of the Incan Empire. The political consequences of pyorrhea have never been traced, but they appear to be a matter for interesting, possibly important, investigation.

Dr. Moodie finds no evidence that the Peruvians practiced dentistry. They attempted serious operations on the skull and other parts of the body, and often with good success. But jaw bones of Peruvian mummies indicate that the idea of extracting a loose tooth or draining an abscess never occurred to them.

Even in Egypt toothaches got little practical attention. An Egyptian surgeon of the pyramid building age, some 4,700 years ago, did operate on a patient suffering from an abscess under a molar tooth. The jaw bone shows that a hole was bored through the bone below the tooth and the abscess was successfully drained. But this progressive adventure in dental surgery did not lead the Egyptian physicians very far into what we would think a most promising field. Examinations of thousands of Egyptian mummies has never revealed certain evidence that the physicians of that land supplied artificial teeth, even to the most influential patients.

A museum in Paris has the jaw of a Phoenician woman who lived about 300 B. C. and who appears to have possessed the world's oldest false teeth. The two right incisors are represented by artificial teeth held in place and bound to each other by fine gold wire. But this is not very ancient surgery as the record of man's diseases goes.

From recent evidence, it seems likely that in our own country operative dentistry had its beginnings about 2000 B. C., among the Indians who lived in New Mexico.

"Experienced dentists after examining a collection of jaws of pre-Pueblo Indians thought to be four thousand years old, have decided that the condition of several of the jaws shows that these Indians practised tooth extraction," Dr. Moodie says. "Growth of new bone in several cases reveals that this process was resorted to as a relief from pain. It is believed that they must have had some instrument made of hard wood, for none of the teeth removed were loose enough to be removed with the fingers alone."

This is an important discovery, Dr. Moodie emphasizes. No primitive race of people have ever heretofore been known to adopt this simple procedure for the relief of pain.

We know very little of the incantations and potions which must have been used to exorcise the demons of the toothache, by any of the forerunners of the modern dentist except that the treatment seems to have been of no practical value on a great many occasions.

The skeleton of an Indian who lived on San Nicolas Island, off the coast of southern California, is cited by Dr. Moodie as showing graphically the unhappy state of a victim of unchecked dental diseases. In this skeleton the paleontologist reads a story of an Indian who was an exceptionally strong type. Tartar accumulated on his teeth, pyorrhea set in, and poisons entered his blood stream. This was accompanied by a serious attack of rheumatism. Almost all of the joints of the man's body, even the ribs, were affected so that he could not move without pain. So far as any one can tell today nothing was done to relieve the abscesses, or at least nothing effective.

One type of toothache was not prevalent in earlier times, and that is the type due to dental decay. Dr. Moodie has found that caries, or formation of cavities in teeth, was about the rarest form of physical distress among the early prehistoric animals. Among the mummies and skulls of early human beings some cavities are found, but not in such commonplace frequency as today. When groups of modern children are examined we hear such results as that 95 per cent. of children entering the first grade of a city have one or more decaying (Turn to page 30)



A mosasaur of the earth's great Age of Reptiles, some 150,000,000 years ago. Bones of such creatures add to the evidence that pyorrhea and dental cavities are just about the world's oldest diseases.

Insane Not Likely to Have Families

Sociology

Encouraging Figures Shown Sociologists

THE encouraging report that men and women suffering from serious mental maladies are not so likely to raise families as are normal persons, was made to a joint meeting in Washington of the American Statistical Association and the American Sociological Society by Dr. Neil A. Dayton, director of research of the Massachusetts State Department of Mental Diseases.

Dr. Dayton has made the first comprehensive survey of the marriages, divorces, and size of families produced by patients suffering from psychoses, that is, such diseases as dementia praecox, manic depressive psychosis, general paralysis of the insane, and alcoholic psychosis. Twelve thousand families of patients discharged from Massachusetts state hospitals during the past twelve years were studied.

Something in the biological make-up of the individual with mental disease interferes with his marrying, Dr. Dayton explained. Among those who do establish homes, the same mental twists interfere with the maintenance of a permanent household. The divorce rate is five times as high among the individuals studied as it is among the normal population. Those psychotic individuals who do reproduce tend to have smaller families than are found in the normal population. Sterility is three per cent. higher among the psychotic patients who marry than among normal individuals.

The figures on two generations obtained by Dr. Dayton indicate in general that mental disease does not tend to stimulate a desire to marry and rear children, but on the contrary it blocks those desires.

The frequently heard statements that birth injuries and advanced age of parents are responsible for much mental disease were refuted by Dr. Dayton, who said that neither of these conditions figures to any extent as a cause of psychoses.

CROWDING of people into cities is tending to produce more and more of what the psychiatrists call introverts, Dr. James S. Plant, director of the Essex County Juvenile Clinic, Newark, N. J., said at another session. Dr. Plant based his remarks on experience with the children brought to the clinic of which he is director.

These introverts are shut-in personalities, as contrasted with the extroverts who are more socially inclined. The introverts find expression for their mental hungers, desires or appetites in symbols, while the extroverts find such expression in physical activities, Dr. Plant explained. Because of the crowded conditions of our modern cities, children and adults alike are driven to symbols for the expression of their desires. Such symbols are to be found in the movies, sports exhibitions like organized baseball and football, and various play spectacles. These provide city dwellers with a vicarious means of expression of their emotions.

While these same symbols exist in the country, rural inhabitants still have more opportunities for physical expression than their city cousins. Dr. Plant said that there was a distinct change in the type of play of the children in his county corresponding with the urbanization of certain areas of it. For example, he said that of some 1,500 children examined, only two were found who were interested in digging caves.

The fall of every great civilization has been preceded by a great interest in the symbols of activity rather than the activity itself, such symbols being found in art, literature, music, and the like, Dr. Plant pointed out. He thought the development of a civilization would show two curves, one of introversion and one of extroversion. The extrovert curve would be greatest early in the civilization but the introvert curve would be greatest later in the civilization and its growth would be followed by the decay of the civilization.

TRAFFIC cops are hard-boiled and patrolmen sometimes dumb because they have not advanced intellectually as rapidly as the masses, Prof. A. G. Barry, of the University of Wisconsin, said in his address.

Growth of cities, wide dissemination of knowledge, changes in public opinion and the ascendancy of social sciences were cited as changes affecting police problems with which policemen have not kept abreast.

Not the police technician or the administrator, but the patrolman, who makes first contact with almost every problem and sole contact with many minor law violators, is the one

whose training is deficient.

The patrolman deals with people and social conditions, whereas most police training schools teach only technique, efficiency, identification, capture and correction, he said. The other type of school, however, which takes into account social problems and makes the personal contacts of the patrolmen promote respect and obedience of law, is increasing.

"The widespread belief in the possibility of an experiment of human behavior has led to the abandonment of respect for law as God-given, for a belief that laws are 'tools' or 'social experiments' created and subject to change by the people who must obey them," declared Prof. Barry.

"Tradition changes slowly when the light of education fails to shine," he continued, "and policemen have been wholly unprepared to accept the responsibility of different treatment for two violators of the same law."

COLLEGIATE scandals and social disorders among students are often the result of a clash between two of the three dominant culture streams in America, Dr. Martin Hayes Bickham, of Chicago, a member of the Committee on Social Analysis of College Communities, told the meeting.

The three streams are the Puritan, originating in New England, the Tidewater, beginning in the South; and the Continental, of more recent origin in urban centers.

Both the Puritan and the Tidewater cultures are characterized by a deep-rooted love of learning and religion. The former spread across the northern part of the United States and the latter across the southern, their influences extending to the Pacific coast.

These two early culture streams were largely rural and Protestant, while the Continental culture, which began to be felt about 1830, was urban and heavily Catholic.

"The evidence seemed to show that students from the Puritan culture influence could mingle fairly easily with students from the Tidewater culture influence," Dr. Bickham said. "The sharper cultural clashes were evident in colleges where youths from immigrant and Catholic backgrounds ventured to go to colleges in which the older culture streams were dominant."

Thomas H. Morgan Given New Honor

General Science

Famous Authority on Heredity Elected A. A. A. S. President

The American Association for the Advancement of Science has chosen Dr. Thomas Hunt Morgan to succeed the eminent physicist, Dr. Robert Andrews Millikan, as president. When the A. A. A. S. meets next Christmas week in Cleveland, Dr. Morgan will preside and Dr. Millikan will give the address as retiring president.

To many the name of Thomas Hunt Morgan is synonymous with the modern theory of the gene as the determining factor in heredity. Upon his observations is based the work of many other experimental biologists. A quotation from the address of Dr. Charles B. Davenport, of the Carnegie Institution of Washington at the Des Moines meeting of the A. A. A. S. shows graphically the place his work has had in solving the great problem of heredity and evolution:

"The mechanism of inheritance has long been a subject of speculation. Since egg and sperm are equal carriers of heredity, yet have little in common but their nuclei, the nucleus was early regarded as the carrier of the mechanism of heredity. Weismann worked out in detail its role and on speculative grounds concluded that the germ plasma or the totality of the chromosome was the special mechanism. The work of the past quarter of a century under the influence of Morgan has placed this hypothesis on a firm basis of fact. Now we know the essential thread in the course of evolution; it is the germ plasma; and the problem of evolution is the problem of the history of the germ plasma. Some one has said that the hen is the egg's method of making more eggs. One may even more truly say that the hen and the cock; the man and the woman, are the germ plasma's method of perpetuating itself; of multiplying infinitely its particular kinds of genes."

Dr. Morgan is now at the California Institute of Technology. Previously he was professor of experimental zoology at Columbia University, and much of his research work has been conducted there. He has also served as special lecturer at many other universities. Yet he has found time to contribute largely to scientific journals and to write a number of widely read books, a few

of which are "Experimental Embryology," "The Theory of the Gene," "Experimental Zoology," "Evolution and Genetics," and "The Physical Basis of Heredity."

His election to the presidency of the American Association for the Advancement of Science adds to a long list of honors. He has been president of the National Academy of Sciences since 1927. He is a member of many learned societies in this country and abroad, and holds doctorate degrees from Edinburgh and McGill universities as well as from Johns Hopkins University and the Universities of Michigan and Kentucky.

The following is a quotation from "The Theory of the Gene," one of Dr. Morgan's best known works:

"There remains, however, a problem of some interest, namely, whether some or many of the changes in the genes that lead to the occurrence of mutant characters (whether recessive, intermediate, or dominant, makes little difference) may not be due to a breaking up of a gene, or to its reconstitution into another element producing somewhat different effects. There is, however, no reason for assuming that such change, if it occurs, is a downhill one rather than the development of a more complex gene, unless it appears more probable, *a priori*, that a highly complex stable compound is more likely to break down than to build up. Until we know more concerning the chemical constitution of the genes, and how they grow and divide, it is quite futile to argue the merits of the two sides of the argument. For the genetic theory it is only necessary to assume that any kind of a change may suffice as a basis for what is observed to take place.

"It is equally futile to discuss, at present, whether new genes arise independently of the old ones, and worse than futile to discuss how the genes arose in the first instance. The evidence that we have furnishes no grounds whatsoever for the view that new genes independently arise, but it would be extremely difficult, if not impossible, to show that they do not arise. . . .

"The only practical interest that a discussion of the question as to whether genes are organic molecules

might have would relate to the nature of their stability. By stability we might mean only that the gene tends to vary about a definite mode, or we might mean that the gene is stable in the sense that an organic molecule is stable. The genetic problem would be simplified if we could establish the latter interpretation. If, on the other hand, the gene is regarded as merely a quantity of so much material, we can give no satisfactory answer as to why it remains so constant through all the vicissitudes of outcrossing, unless we appeal to mysterious powers of organization outside the genes that keep them constant. There is little hope at present of settling the question. A few years ago I attempted to make a calculation as to the size of the gene in the hope that it might throw a little light on the problem, but at present we lack sufficiently exact measurements to make such a calculation more than a speculation. It seemed to show that the order of magnitude of the gene is near that of the larger-sized organic molecules. If any weight can be attached to the result it indicates, perhaps, that the gene is not too large for it to be considered as a chemical molecule, but further than this we are not justified in going. The gene might even then not be a molecule but only a collection of organic matter not held together in chemical combination.

"When all this is given due weight it nevertheless is difficult to resist the fascinating assumption that the gene is constant because it represents an organic chemical entity. This is the simplest assumption that one can make at present, and since this view is consistent with all that is known about the stability of the gene it seems, at least, a good working hypothesis."

The election of Dr. Morgan to the presidency of the American Association sets a remarkable record for the California Institute of Technology. In four years, three of the Association's heads have come from "Caltech." In December, 1926, Dr. Arthur Amos Noyes, director of the Gates Chemical Laboratory at the Institution, was elected. Dr. Millikan is president of the institution.

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Monogamic

IN the good old romantic days we used to think that birds mated for life. Then some callous destroyer of illusions made the claim that they not only change mates every spring when they come north again, but that they divorce and marry other spouses when the time comes to raise the second of the two broods of young which most birds bring up each year. To get at the real facts in the case, Mrs. Margaret Morse Nice, of Columbus, Ohio, tagged a lot of birds with little numbered bands around their legs and studied them for several seasons.

"Five pairs of three species shifted mates in one season, but in twenty pairs of eleven species there was no change," she said. "The species that changed were brown thrasher, house wren and bluebirds. The species that did not change were phoebe, junco, chipping sparrow, field sparrow, song sparrow, towhee, cardinal, catbird, house wren, robin and bluebird."

"Both house wrens and bluebirds leave the nesting site for a period after one brood is raised. Brown thrashers appear to make a definite new start for the second brood, for the male resumes singing for a few days at this time."

"Many species, however, stay continuously on their territories and moreover their nesting cycles overlap. Female song sparrows, robins, cardinals and migrant shrikes have been watched building new nests while still feeding young of the first brood. In such cases the seeking of new mates is impossible."

Ornithology

Science News-Letter, January 11, 1930

Scientific Consultants

Announcement that the Library of Congress is adding to its staff of consultants two scientists has just been made by Col. Lawrence Martin, chief of the division of maps at the library. As the scientists chosen are two well known geologists and geographers, the announcement was made before the Geological Society of America.

The appointees are Prof. Alfred C. Lane, of Tufts College, and Prof. Albert P. Brigham, of Colgate University. Since the Library of Congress has a famous map collection, it is a mecca for specialists and inquirers at large who are interested in geography and geology, and the appointment of scientists from these fields is regarded as especially fitting.

Having research consultants at the

library represents an innovation, Col. Martin said. The corps of consultants already named for this year includes specialists in economics, European history, philosophy, and various fields of literature. A specialist in church history, Prof. Charles S. Lane, has just been added.

General Science

Science News-Letter, January 11, 1930

Amateur

Not all the work of the Weather Bureau is done by professional meteorologists. At the meeting of the American Meteorological Society, Clarence J. Root of the Weather Bureau station at Springfield, Ill., paid tribute to the work of the co-operative observers. There are about 5,000 of these volunteer workers, he said, some of whom have served continually for 40 years, furnishing records that have proved of use not only to meteorologists, but also to engineers, agriculturists, manufacturers and business men.

Meteorology

Science News-Letter, January 11, 1930

What Freshmen Do

Approximately eighty per cent. of the average college freshman's time is spent in eight activities, according to Dr. Richard S. Uhrbrock of Cornell University, speaking before the American Association for the Advancement of Science. These activities, in order of time occupied, are sleeping, attending classes, studying, eating, working for pay, walking, physical exercise, and "bull sessions." For the benefit of the uninitiated, the last named may be described as periods of informal conversation in which the undergraduates discuss every subject under the sun. These sessions usually are held in students' rooms, or in fraternity houses. Faculty members are seldom present.

In a study of the distribution of time for one week, made by Dr. Uhrbrock at Cornell, it was found that the typical college freshman spends approximately one-third of his time in sleep, one-third in work activities, and one-third in social, play and personal pursuits.

When students who made high grades were compared with those who were failing, it was found that the high scholarship men had the following general characteristics. They spent more time in class attendance, studying at home; in library work; on class and fraternity committees; writing reports and themes; walking or riding to and from classes; in remunerative work;

IN VARIOUS C

reading newspapers, magazines, novels; on family duties; listening to visiting lecturers; keeping record of use of time. They spent less time in conferences with instructors; in physical exercise; attending movies, plays and concerts; on parties, dates and dances; card playing; automobile riding; "bull sessions"; shopping; telephoning; at meals; bathing, shaving, dressing; sleeping.

Sociology

Science News-Letter, January 11, 1930

Discriminating

Some animals have a sense of taste just as critical and digestive organs just as sensitive as those belonging to human beings.

That is what B. B. Mundkur and R. L. Cochran, of the Iowa Agricultural Experiment Station, found when they tried to make farm animals eat scabby wheat.

Barley diseased by scab is unpalatable to humans. And next to humans, guinea pigs like it least. They simply will not eat it. Even a half diet makes them lose weight, it was found.

Of course, hogs will eat—until they become nauseated. And then they would rather starve than eat the stuff.

Two-weeks-old chicks showed a loss of weight and their plumage roughened when fed on the diseased grain. Their elders didn't seem to mind it. But both the young and old chickens, since they were not given an exclusive diet of barley, picked their feed over carefully and rejected much of the diseased grain.

Cattle, sheep and poultry suffer no ill effects from eating scab-infected barley.

Zoology

Science News-Letter, January 11, 1930

Mustiness

A study of the bacteria that cause the peculiarly unpleasant musty odor sometimes found in eggs was reported to the Society of American Bacteriologists by Max Levine and D. Q. Anderson of Iowa State College. These scientists were able to isolate from the eggs the organisms causing the mustiness. Characteristics of the organisms were described at the meeting.

The development of mold on the shells of eggs in cold storage depends on conditions surrounding the

SCIENCE FIELDS

eggs previous to storage, L. H. James and T. L. Swenson of the U. S. Bureau of Chemistry and Soils reported at the same session. Chief among these conditions was shipment of eggs in unseasoned wood.

Experiments were conducted in which different lots of eggs were subjected to the following treatments: sweated, shipped in cases of green or partially seasoned wood, with dampness in flats and fillers, washed, oil-protected, and untreated for controls. Half of each such lot was inoculated with a mold-forming organism, and then all the eggs were placed in the regular cold storage. Periodic examinations of the eggs showed that only the eggs in cases made of unseasoned wood developed the characteristic black colonies of the mold. Eggs shipped from California to New York in cases of unseasoned wood likewise showed definite pin-spot molding on arrival in New York and in subsequent cold storage developed the mold to a marked degree, the scientists found.

Bacteriology

Science News-Letter, January 11, 1930

Twins

Twins may be so confusingly alike that they can scarcely tell themselves apart, but their finger prints may be depended upon to identify each, studies by Prof. H. H. Newman of Chicago University demonstrate.

Prof. Newman has finger-printed 100 pairs of twins and in no cases were the prints enough alike to puzzle an expert. Finger prints of identical twins, that is, the type of twins that are practically duplicates of each other, are frequently strikingly similar, but never identical, he emphasized. Fraternal twins, that is, boy and girl twins or other pairs not identical in appearance, are not even strongly similar, so far as finger prints go.

Anthropology

Science News-Letter, January 11, 1930

Stone Head

A great stone, naturally shaped like a human head and carved with teeth, ears, eyes, and flattened chin, is a strange new discovery from Texas, unearthed from its resting place beneath sixteen feet of undisturbed gravel.

Dr. E. H. Sellards, geologist of the University of Texas, brought news of the discovery to the Paleontological Society. The stone head ap-

pears to be a new piece of evidence than man existed in America in ancient times.

Judging by the geological conditions of the region, the stone must have lain in place while the gravel from nearby streams washed over it forming finally a layer more than sixteen feet deep, Dr. Sellards said. The streams have long since ceased to wash gravel over the site. The stone weighs at least 75 pounds, possibly 100, he reported.

Archaeology

Science News-Letter, January 11, 1930

Not Exact

The old belief, widely held at the beginning of the recent great industrial development, that all science could be calculated with mathematical exactness no longer holds true, W. A. Shewhart, of the Bell Telephone Laboratories, believes. He told the American Association for the Advancement of Science that scientists now do not expect to make a thing exactly as they want it, and that they will revise their methods to make better use of this new knowledge.

Mathematics

Science News-Letter, January 11, 1930

Trout Food

The Loch Leven trout which were introduced into the waters of the Black Hills of South Dakota thirty years ago have a comparatively limited range of preferences in diet. Examination of the stomach contents of a considerable number of the trout by Richard C. Zalesky and E. P. Churchill of the University of South Dakota showed that the young stages of just four kinds of insects constituted by far the bulk of the fishes' food.

Icthyology

Science News-Letter, January 11, 1930

Light for Singing

Just how much light does a robin require, to keep on singing at the end of day?

That is one of the problems which Dr. Jesse M. Shaver and Miss Ruby Walker, of the George Peabody College for Teachers, Nashville, set for themselves. With an illuminometer they measured the amount of daylight still left when the last bird sounded his last note.

Some robins will keep on singing until it becomes totally dark, they reported. Others stop when the outside illumination still amounts to ten foot-candles. This is equivalent to about one-tenth that of an ordinary daylight-illuminated office or school-room.

Ornithology

Science News-Letter, January 11, 1930

Rare Sugar

Xylose, a sugar so rare that it has heretofore been a laboratory curiosity at \$100 a pound, can now be turned out cheaply at a few cents a pound, requiring no raw material other than waste cottonseed hull bran, water and sulphuric acid. At the meeting of the chemistry section of the American Association for the Advancement of Science, Warren E. Emley of the U. S. Bureau of Standards, described the process by which seed waste is changed into sugar.

Xylose is different from its nearest neighbors in the sugar world, the hexoses or glucose type of sugars, in that it contains five carbon atoms to the molecule instead of six. Because it has always been so rare and expensive, it has never been possible to perform any extensive experiments with it, and consequently it has no known uses. But the experimental plant at Anniston, Ala., can turn out a hundred pounds a day, and when larger units are built they will have an annual production of about a million tons of cottonseed hull bran to work on. So that if xylose has any uses it should not take long now to discover them.

Mr. Emley suggested that it might be used directly in food products, or possibly industrially as a raw material for alcohol, acids and other chemicals.

Chemistry

Science News-Letter, January 11, 1930

Vibration

A well-constructed office building has little to fear from earth vibrations caused by heavy traffic, Prof. C. C. Williams, of the University of Iowa, told members of the American Association for the Advancement of Science.

"Man's senses usually exaggerate the vibrations caused by street traffic, passing trains or rotating machinery," said Prof. Williams. "A movement of only one-thousandth of an inch ten times a second seems a rather violent shaking to ordinary senses," he explained. "Even the little street vibrations cause pictures to become askew on the wall and make dishes move because there is a more rapid movement in one direction than in the other."

During an earthquake the amplitude of the vibrations seldom exceeds a fraction of an inch, the speaker pointed out.

Engineering

Science News-Letter, January 11, 1930

Plant Warfare---A Science Classic

Botany -- Ecology

Struggle for Domination in the Vegetable Kingdom

OECOLOGY OF PLANTS, An Introduction to the Study of Plant-Communities, By Eug. Warming, assisted by Martin Vahl, prepared for publication in English by Percy Groom and Isaac Bayley Balfour. Oxford, 1909.

HITHERTO we have treated plant-communities as if they were static entities, in a condition of equilibrium and with their evolution concluded, and were living side by side at peace with one another. Yet such is by no means the condition of affairs. *Everywhere and unceasingly* a struggle is taking place not only within the several plant-communities but also between them, so that each of these is continually striving to invade the territory of the others. Moreover, *each slight change in the environment* upsets the condition of equilibrium hitherto existing, and at once occasions a disturbance and change in the reciprocal relations subsisting. *Extremely slight* changes in the environment often evoke remarkably great changes in the vegetation, by favouring certain species and suppressing others. "Rise and fall of the water-table should be considered in inches, not in feet," writes the experienced practical man Feilberg. The zonal distribution of vegetation round small lakes and pools that one observes in West Jutland, the distribution of Weber's "sub-formations" of meadow, and that of the several "types and sub-types" of heath, all tell the same tale. Moreover, P. E. Müller shows that minute climatic changes suffice to cause forest to give way to another kind of vegetation. From Gräbner we learn that relatively small distinctions in the climate of different parts of the North German plain cause the local floras to be sharply delimited. Attacks by insects or fungi, dry or rainy years, and so forth, may bring about changes. The struggles in question have been the subject of extremely little investigation, so that a wide and attractive field of research lies open.

The struggle between communities is of course dependent upon that between species, to which allusion has already been made. This struggle is

The author thus describes his book, which established a new science: "In 1895 I published a Danish work entitled *Plantesamfund*, which was based upon lectures that I had delivered in the University of Copenhagen. I never imagined that the book would appeal to more than a few readers outside my audience . . . When I wrote it I had no models to study; mine was the first attempt to write a work on Oecological Plant-geography, of which the very name was then all but new. The present book is practically a new one . . . In many places I have felt the lack of definite, detailed, and truly oecological information concerning various questions, and, as in 1895, I must confess that my ideal is far from being realized. The oecology of plants is a subject still in its infancy; numerous investigations must be made before the foundations can be truly and rightly laid, and before a consistent clear, and natural classification of plant-communities is achieved."

caused by endeavour on the part of species to extend their area of distribution by the aid of such means of migration as they possess. "Situation wanted" is the cry in all communities, whether these be human or vegetable. Millions upon millions of seeds, spores, and similar reproductive bodies are annually scattered abroad in order that species may settle in new stations; yet millions upon millions perish because they are sown in places where physical conditions or nature of the soil check their development or where other species are stronger.

Not until recent times was attention drawn to the ceaseless struggle among species. Darwin it was who directed our notice to this struggle, which forms the basis of one part of his hypothesis concerning the origin of the species. Yet other writers had previously noted this struggle in nature; for instance, A. P. de Candolle wrote: "Toutes les plantes d'un pays, toutes celles d'un lieu donné, sont dans un état de guerre les unes relativement aux autres."

The struggle and competition among plants are brought into greater prominence by changes that continue

without interruption in soil, climate, or other conditions affecting plant-life, including changes in the animal world.

Without such changes the results of the struggle would be neither so distinct nor so rapid. The changes in questions are:

I. Production of new soil.

II. Changes in old soil, or in the vegetation covering it, and in the factors discussed in the first Section of this work, but particularly those caused by man, who is thus responsible for "semi-cultivated" formations. Man intervenes directly when he utilizes the soil for his own purposes, by converting forests into arable ground, or by draining moors, but he also intervenes indirectly when permitting cattle to graze, or when he mows, manures the soil, and so forth.

In regard to the question now under discussion reference should be made to Clement's interesting work, "The Development and Structure of Vegetation" (1904). In discussing the migrations and invasions of plants Clements distinguishes between migration and "ecesis". "Migration merely carries the spore, seed, or propagule into the area to be invaded; ecesis is the adjustment of a plant to a new habitat, it is the decisive factor in invasion, inasmuch as migration is entirely ineffective without it." In discussing invasion he treats of barriers, endemism, polygenesis, also manner and kinds of invasion.

The struggles between communities and the development of these are elucidated in the succeeding chapter.

WHEN new soil arises anywhere it is soon invaded by plants. And it is of deep interest to follow the successive phases in the development of the vegetation. In this way one will acquire evidence of a long series of struggles among the successive immigrants; these struggles sometimes do not end in any decisive result before the lapse of many decades.

New soil arises in the following places: on coasts, where the sea deposits fresh material; at the mouths of rivers; even in river-beds, where masses that have been washed down

are deposited. New soil also arises by the following agencies: action of glaciers, talus, volcanic eruptions, fire that devastates the original vegetation, and human action, but particularly where cultivated land is left to itself. In the last cases the soil is not new to the same extent as in the first cases; it is not barren, but includes a greater or smaller number of seeds and the like. . .

It is difficult to make general statements in regard to vegetation appearing on new soil, because very few detailed investigations bearing on the subject have been conducted. Published work seems to justify the following conclusions:

I. In many cases, possibly always, the first colonists are algae and lichens, as well as mosses (for example, arenicolous algae on the shore, algae and lichens on lava-fields, rocks, and so forth); these prepare the way for Vascular plants. The early vegetation is open. Some time elapses before a coherent covering of vegetation is produced. So far as Vascular plants are concerned, the individuals are at first very scattered, but gradually increase in numbers.

II. The number of species present is small at first; it increases, until after the lapse of a certain length of time it is greater than ultimately. For, at first, many species find suitable spots, but are subsequently suppressed when the vegetation forms a continuous covering and more tyrannous species have entered. Various parts of the recently colonized ground are often clothed with plants in a very dissimilar manner. Gradually the vegetation becomes more uniform and poorer in species.

III. Very frequently annual and biennial species are more numerous at first than later on, because on open ground they find the conditions more favourable to them than on overgrown ground; many of them belong to the local weed-flora. Afterwards perennial herbs or woody plants preponderate.

IV. The first species to enter are those which occur in the vicinity and possess the best means of dispersal by wind or by birds. Rubble-heaps in the Alps are first colonized by species with wind-dispersed seeds. In Norway, when a coniferous forest is destroyed, the first immigrants are the birch and poplar (with fruits and seeds respectively that are easily conveyed by wind) and *Sorbus* (which has berry-like fruits).

V. So far as the immigration of

trees is concerned, light-demanding trees precede shade-enduring ones; the reverse is impossible. Shrubs are suppressed by trees that enter subsequently.

VI. The differentiation of sharply defined communities proceeds gradually. The earliest commingled individuals in reality belong to different natural communities, which only little by little distribute themselves in the most suitable stations. One can therefore speak of *initial*, *transitional*, and *final communities*. . .

THERE is scarcely any biological task more attractive than that of determining the nature of the weapons by which plants oust each other from



Forest invading daisy-field

habitats. Yet we are far from having exhaustively solved the problem even with regard to a single species; for instance, we do not completely comprehend the struggles between the beech and oak, or between other economically important forest-trees. Obviously the matter is not settled by asserting that lack of available space is decisive, or that in the plant world, as in all other communities (including the human race), everything turns on the question of nutrition. Such statements scientifically analysed resolve themselves into a series of the most difficult questions which science could propound, and which could be answered only after many-sided investigations. For instance, there arise such questions as: "Is it lack

of one or another nutritive body or water in the soil? Or the excess of another substance? Is it want of heat or of light or of an appropriate combination of these? Or can roots and rhizomes grow so close together as to bar the way to other plants in a purely mechanical manner, or so as to rob them of water and nutriment? And so forth.

We see perennial herbs extinguishing annuals that have settled on ground which was bare but a short time before; but with what weapons the former conquer we cannot say with any certainty. We see silicicolous vegetation of sand (*Ornithopus perpusillus*, *Teesdalia*, *Spergula*, *Rumex Acetosella*, *Pteris aquilina*, and others) disappear when the sterile field is supplied with lime (either by special addition of lime as a food-material, or by a change in the lime already present so that this becomes more easily available to plants); and we see this vegetation gradually return as the carbonic acid in the water dissolves and carries away the lime; but we can give no deeper explanation of these phenomena.

Living beings forming a community have their lives linked and interwoven into one common existence in so manifold, intricate, and complex a manner that change at one point may bring in its wake far-reaching changes at other points. In this direction a wide field lies open for investigators. . .

The general statement can be made that a species has the greater probability of emerging victorious from its struggle the greater the extent to which it finds itself in its *optimal area*, or in other words, the more numerous are the oecological conditions best suited to it. Consequently a species has always to engage in its hardest and most exhausting struggles at the boundaries of its distributional area, if it has here reached the utmost limit of its wanderings as determined by climate. The more suited is the climate to a species, the less exacting is this as regards soil and other conditions, and the more capable it is of competing with rivals. If a species of tree be burned down or felled on a station lying within its optimal area, it will as a rule reoccupy the denuded spot if this be not artificially interfered with; but if it meets with this fate outside the area of its best growth, then it will not reappear, but its place will be taken by a species of tree in whose optimal area the station is situate.

Science News-Letter, January 11, 1930

Antiseptic at Turn of a Switch

Medicine

Powerful Solution Made From Salt

ANTISEPTIC solution made to order at the turn of a switch is now a possibility. A new machine takes common salt and ordinary lighting current and automatically produces a powerful antiseptic in just the right concentration. The antiseptic, known to physicians as Dakin's solution and to chemists as sodium hypochlorite, is formed in a specially designed miniature electrolytic cell which was developed in the chemical engineering laboratories at Iowa State College.

Carbon electrodes were adopted for use in this cell after trying out electrodes of platinum, tantalum, nichrome, and carbon. The upper electrode, or cathode, is hollow and slips over the lower electrode, or anode, from which it is insulated by an insulating cement. The electrodes are contained in a cylindrical glass bulb, the bottom of which is drawn out to a small tube. The salt solution enters at the bottom and as it flows between the electrodes it is decomposed, forming sodium hypochlorite solution. This passes out through a glass tube on the side of the cell. The rate of flow is regulated by a glass stopcock.

The current is supplied from the alternating current light line through a battery charger and is regulated by a rheostat. The flow of the solution through the cell is controlled by an automatic valve which remains open while the current is flowing. After the current and solution flow have been regulated, sodium hypochlorite of the proper concentration and alkalinity is produced at the turn of the switch.

The whole apparatus except the salt container and battery charger can be placed in a box six by twelve by seven inches, which is large enough for a physician's office. A portable set operating from the storage battery of a car, or a larger set for hospital use can be made.

Dakin's solution, which this apparatus produces, was selected from over two hundred antiseptics as the best antiseptic and irrigating agent for war wounds. Its use has been limited because of its poor keeping qualities and the technical skill necessary for its preparation in proper concentration. The new apparatus

is simple in construction and provides freshly prepared solution as wanted at low cost.

Over-Optimistic

"Too much faith has been placed in our falling death rate from tuberculosis as evidence that this disease is under our control," Dr. William Charles White of the U. S. Hygienic Laboratory told members of the American Association for the Advancement of Science.

Complete conquest of this grave disease has not yet been made in spite of splendid advances. Overconfidence at this stage is to be avoided, especially because of the harm it may do by turning the public mind from this great task that still confronts the nation.

There are still probably over 160,000 deaths annually from tuberculosis in the United States. Statistical figures of death rates give but one small phase of the picture. The rise of incidence of tuberculosis in young girls, studies of incidence of the disease in school children, such as those made by the Phipps Institute in Philadelphia, the appalling death rate from this cause among Negroes and Indians, and the rise in the death rate in some cities in spite of valiant efforts being made, all point to a task scarcely yet begun, Dr. White said.

He also described the scientific investigations being sponsored by the National Tuberculosis Association, which it is hoped will lead to complete understanding of the tubercle bacillus, its life history and chemical methods, and finally to its complete conquest.

IT takes about half a second for the eyes to change from looking at a near object to a more distant one, Herbert H. Jasper, of the University of Iowa's Psychopathic Hospital, reported to the American Association for the Advancement of Science.

By testing the time it took the eyes to change from converging on one of three lights 17, 30 and 70 inches away in an otherwise dark room to one of the others, Mr. Jasper found that the average time on

first trials varied from 557.1 thousandths of a second for the two nearest lights to 626.2 thousandths for a change from the nearest to farthest. A second set of measures showed improvement.

Investigations of how the world looks to rats were reported by Prof. Paul E. Fields of Ohio State University. The rat is supposed to have eyes which are not capable of discriminating forms, such as the triangle, Prof. Fields explained. But in his experiments twenty-five white rats learned to discriminate between a triangle when the apex was pointing up and when the apex pointed down.

INTELLIGENCE tests given to mentally ill patients from time to time are a useful barometer to measure their progress toward normality, or their sinking back into more serious abnormality, Dr. Emmett L. Schott, of the Henry Ford Hospital at Detroit, told doctors attending the sessions of the American Association for the Advancement of Science.

Normal persons do not vary much in intelligence from year to year. Patients suffering from mental and nervous maladies, however, frequently lose many points in their ability to meet the requirements of intelligence tests, Dr. Schott's records show. Gains in ability to pass the tests are useful indicators of mental improvement in such patients, he has found.

Describing particularly a number of cases of general paresis, Dr. Schott said that one woman had a mental age of almost fifteen years when first tested. After a year during which she had no treatment for her disease she dropped to a mental age of less than thirteen years. Deterioration in such cases is expected, but the tests gave an actual measure of the rapid change. Other cases which went without treatment showed similar rapid mental decline. On the other hand patients who received the malaria treatment or other special attention for paresis, did not lose ground mentally, and some improved in their mental abilities, the tests showed.

Coin Dates Tomb As Early Christian

Archæology

Bronze Piece From Mint of Herod is the Clue

A TOMB in Palestine used during the first years of the Christian era has been explored by Dr. William F. Bade, of the Pacific School of Religion. The tomb was found near the site of Tell en-Nasbeh, which Dr. Bade believes to be the town of Mizpeh mentioned importantly in the Bible. The site is seven miles north of Jerusalem.

Reporting his discoveries to the Archæological Institute of America, Dr. Bade said that a bronze coin is the most valuable clue to the age of the tomb. Because of the peculiar political conditions in Palestine just after the birth of Christ, the age of the tomb can be estimated within a few years by this single bit of bronze. The coin bears a wreath on one side and the prow of a war-galley on the other, and was from the mint of Herod Archelaus, who succeeded his father, Herod the Great, as ruler of Judea. Archelaus was cruel and so unpopular that his reign was brief. He was deposed about six years after the birth of Christ.

"It is extremely unlikely that coins of Archelaus circulated more than a year after his banishment," Dr. Bade said, "and this for two reasons: first, he was so hated by the Jews that they probably removed all signs of his rule as soon as possible; secondly, Herodian rule ceased altogether in Judea after the removal of Archelaus."

Judea, he explained, was then placed under the immediate rule of the Roman Empire, and this fundamental change of administration would have brought a change of coinage.

Two lamps were found in the debris of the tomb, and many glass beads with marked opalescence, probably due to long burial. A find of unusual interest was a small die, which was worn as an ornament, and bears the impression of what appears to be a donkey rearing in front of a human figure with upraised arm.

"The design quite naturally suggests Balaam's ass and the angel," Dr. Bade pointed out. "In view of the fondness of antiquity for mock representations of enemies, one can scarcely help wondering whether this seal involves a mocking allusion to Archelaus."

The tomb had been rifled some years ago by an Arab purveyor of

antiquities, but a variety of objects remained, all of particular interest, like the tomb itself, because of their definite reference to the beginning of the Christian era. Other nearby tombs were also explored in the search for the burial grounds of the ancient community at Tell en-Nasbeh, and Dr. Bade reported the finding of a number of rock tombs, some containing pottery of the types made in the Iron Age of 750 B. C. and earlier.

Entrance to newly excavated Palestine tomb of the days of Christ. A coin from the mint of the hated Herod Archelaus dates the tomb with reasonable certainty.



The five tombs examined range from the beginning of the Age of Iron down to the late Roman period, and Dr. Bade hopes that as new discoveries are made in the region it will be possible to obtain a clearer conception of changes in architecture of tombs in Palestine through the days described in Biblical history.

Work of the archæologist is hampered in this region by the past activities of Arabs who used to hunt the tombs and extract antiquities to be sold to tourists. Under British rule, this occupation has become too precarious from a legal standpoint, but many sites are already pillaged, so that their significance is obscured.

HOW the oldest, most fragile furniture ever found in a royal Egyptian tomb was restored from a condition like cigar-ash dust to its

at the same meeting by Dows Dunham of the Boston Museum of Fine Arts.

Mr. Dunham accompanied Prof. George Reisner in the recent excavation of the tomb of Queen Hetepheres I at Giza. Her tomb, dating from the fourth dynasty which ruled Egypt some 5,000 years ago, is the oldest tomb of Egyptian royalty ever found with its complete furnishings of gold work, jewelry, and household furniture.

The alabaster sarcophagus of the queen was in a little rock chamber, and all about the floor was a deep laid mixture of decayed wooden furniture originally cased in gold sheets, stone and copper vessels, pottery, textiles and baskets, panels of wood inlaid with gold and faience, and a blending mass of rubbish, stone chips, and dust.

For 280 days, the staff and native assistants worked with a precision and care that exceeds any technique of detectives preserving the evidence at the scene of a mysterious crime. Detailed plans of the floor surface were made, with every visible object drawn in, gold being represented by red, wood by purple, and other materials by black, Mr. Dunham explained. A camera shooting from above, with powerful electric lamps ranged at vantage points, made photographic records of the same area.

Before most of the wood, cloth, or basket work could be touched safely, it had to be treated with a solution applied with a medicine dropper, and even with this preservative coating it was advisable to lift the smaller objects with forceps. The gold castings of the furniture proved a valuable guide to the original dimensions of the objects, for the wood itself had long since fallen into a state of collapse or had shrunk within the pieces of the golden cases.

When one layer of the funeral trappings was removed, the whole process of charting, photographing, and removing of exhibits was repeated for the next layer beneath. Each bit of royal jewelry or furniture was numbered, measured, sketched, and ticketed as it was taken from its dusty resting place, Mr. Dunham reported.

Future of Teeth—Continued

teeth and about one-third have abscess formation. While at college age, we hear of 3,000 students being examined at one institution and only ten perfect sets of teeth being found.

Cavity formation due to bacteria entering through the enamel of the teeth occurred less often when people had little or no sugar in their diet, Dr. Moodie points out. Then too, he adds, the gritty food eaten by many tribes wore off the teeth so rapidly that caries seldom gained a foothold. The grit consisted of sand, bits of stone from grinding bowls, pieces of nut shell, seeds, bits of bone. Such extra materials were carelessly mixed in with the food when it was prepared or eaten. The teeth all wore down evenly until pulp infections occurred and then abscesses formed. After that, pain would cause the individual to chew unevenly and the teeth would wear unevenly. This would also cause disturbances of the joint surfaces near the ear and possibly deafness.

Some tribes knew the tortures of toothache much better than others. Among the early inhabitants of New Mexico caries often attained a great development, so that molar teeth were reduced to mere shells, with cavities extending far down into the roots. And a study of 300 Indian skulls from California showed Dr. R. W. Leigh that one Indian in four had carious teeth.

"Among modern white people, the wisdom teeth offer great disturbances and sources of pain from being impacted and decayed," Dr. Moodie says. "It certainly seems probable that our wisdom teeth are on the road to extinction, and if the white people lose their teeth the wisdom teeth will be the first to disappear."

Science is only now probing the facts about nutrition in its connection with tooth building and the facts about the bacteria involved in pyorrhea and dental decay. Such knowledge might be expected to play a major role in warding off the toothless age of the race.

Dr. Moodie points out that some people today are largely immune to diseases of the teeth. In the same household a brother may suffer from one decaying tooth after another while his sister, otherwise no healthier than he, may escape all dental troubles. If the factors that bring about that immunity can be understood and the knowledge generally applied, the dental evolution of the race may turn

out to be a matter of general improvement of the health and strength of the teeth rather than the specialized, horny gums which have been pessimistically predicted.

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Rear tires of an automobile wear one-fifth faster than front tires, according to a recent experiment.

A plant now being erected in Germany will manufacture citric acid by fermentation of molasses.

America's death toll of fighters in the World War in two years was 37,000; 96,000 Americans were killed by accidents in 1928.

Reindeer meat differs little from beef or veal of the same grade, but in general contains less fat and a little more protein.

Indian medicine men were the first to use bark and leaves of the witch hazel plant to alleviate pain, a botanist states.

An underground camera which photographs the progress of drilling for oil wells is an aid to the drillers in keeping the hole to the proper course.

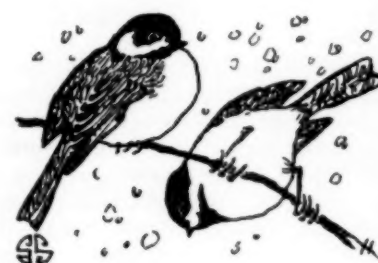
Easter lilies are grown commercially in Florida.

Government experts have developed apparatus to calculate the amount of air passing through different fabrics.

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NATURE RAMBLINGS



Feeding the Snowbirds

There is a large population of birds that either remain with us through the winter or come down from Canada during the snowy season, and these cheerful little tumblers in feathers often find life hard when the weather is cold and the snows are deep. The crumbs from our tables are feasts for them, and a dish of water is a grateful gift for dry little throats that cannot find any that has not been frozen into solid ice.

Scattering crumbs on the snow or the open ground is well enough, and you will be thanked for it; but it is much better to put it into a box on top of a post, where the little feasters will not be subject to the sudden on-fall of a sneaking cat. Such a box may be simply a shallow tray made of the bottom of an ordinary small wooden packing case. But an open tray fills up with snow, so that it is better to have it sheltered from the prevailing winds with a partial wooden canopy. Into this box go the breadcrumbs, pieces of carrot and other bounty you may have for the birds. But a special gift, a lump of suet, should be wired or nailed to the post or to the branch of a tree nearby, to give the birds a hearty meal of animal stuff with plenty of calories in it.

When you give them water, do not stick strictly to the Biblical "cup of cold water." In freezing weather cold water will quickly turn to ice. Warm up the water until it is as hot as good hot coffee or tea, and pour it into a warmed pan. Then it will last many times as long before it goes solid.

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In the Island of Jersey cabbages grow taller than a man's head, and the long stalks are dried and polished and sold to tourists for walking sticks.

Myths Hint Indians Knew Mammoths

Archaeology

DID the early Indians on this continent know the great hairy mammoth, monstrous survivor of the Ice Age? Did they hunt him for his meat and hide and ivory?

Prof. William Duncan Strong of the University of Nebraska thinks it possible. Before the anthropological section of the American Association for the Advancement of Science, he told of evidence which he has found in the myths of certain remote Algonkian tribes that seems to point that way.

The first was secured from the Naskapi Indians of northern Labrador. The Naskapi are an extremely isolated and conservative group who retain to the present time many primitive customs and beliefs. In the quite widespread Djakabish legend the Naskapi version tells of a huge primal monster that destroyed the parents of the hero.

"The animal is described as very large, with a big head, big teeth and a very long nose with which he hit people," said Prof. Strong. "His tracks in the snow were deep and round. After a considerable struggle Djakabish killed this monster with his arrows, cut him up and used the ears for his bed. The native name for the creature is 'Katcetoask' and one Indian who had seen pictures of the elephant translated it by the latter name. The same native term is used by the Rupert House Cree in their version of the legend.

"The second reference was secured by Dr. F. G. Speck from the Penobscot Indians in Maine," Prof. Strong continued, "Here Snow Owl, a Penobscot culture hero, was searching far to the south for a wife. He noticed that the water courses were drying up and followed up the valleys to find what caused it. He noticed what seemed to be hills without vegetation moving slowly about. Upon closer scrutiny he saw that these masses were really the backs of great animals with long teeth, animals so huge that when they lay down they could not get up. They drank half a day at a time, thus taking up all the water from the land.

"Snowy Owl went on and after many adventures secured his wife. Then he returned to the place where these animals had their 'yard'. Here he cut certain trees upon which the monsters were accustomed to lean for rest at night so that when they

did so the trees would break. Thus the animals fell upon the sharpened stumps and Snowy Owl shot them all. The water courses filled up and his people rejoiced.

"Both of these myth fragments call to mind the 'great elk' legend, recorded by Father Charlevoix in 1744, an 'elk' which made all others seem like ants, that could walk without difficulty through eight feet of snow and whose skin was proof against all sorts of weapons. Most remarkable of all, the old Indian account stated that the monster had an arm coming out of his shoulder which he used as they did theirs. Only a very vivid imagination or the sight of a living, not a fossil proboscidean, could account for such a description as this."

SOME of the oldest American immigrants, whose fossil forms were buried within the soil millions of years ago, were described before the Paleontological Society by Dr. Willard Berry, of Ohio State University.

Describing fossil remains of mollusks and other forms of life found in South America, in the West Indies, and in the distant East Indies, Dr. Berry concluded that there must have been a migration route for some prehistoric creatures across the Pacific from the East Indies. It has usually been assumed that the route was across the Atlantic, from the European Mediterranean.

"I am not trying to argue for a Pacific continent, establishing a land bridge over the present wide Pacific ocean," Dr. Berry said. "These East Indian and equatorial American similar forms must have crossed the area at a time when there was shallow water of general tropical character."

The marine animals described by Dr. Berry were chiefly from the Eocene period of prehistory, which according to some estimates would give them an antiquity of 55,000,000 years.

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12,000 Fossil Shells Examined

Paleontology

How a work of ten years' duration, in the course of which 12,000 fossil shells were examined under the microscope and hundreds of photographs and drawings were made, is helping to solve some of the riddles of evolution left unanswered by Darwin, was explained in a report to the Paleontological Society of America, by Prof. C. L. Fenton, of the University of Buffalo.

"Whole races, families and even phyla of animals are born, develop, grow old, and die," Dr. Fenton says. "They do so in the same way that the individual goes through the life cycle, and probably for the same reason.

"There are hundreds of cases in which races of animals have come into existence, have developed characters which seem to have no value, or which even were harmful, and then died. The series of changes are so regular that if one finds part of the fossil record of such a series he can predict what the rest will be, and how it will end. This is a kind of evolution Darwin does not explain."

The reason for this is that the metabolism, or power of the animal to carry on the essential life processes, decreases with the age of the family just as it does with the age

of an individual, Dr. Fenton suggests. The theory is not new to science, he says. He has just applied it in a new way.

In his examination of thousands of shells under the microscope, Dr. Fenton has observed that this decreasing metabolism is indicated by a steady degeneration in the ornamentation of the shell.

In the lower beds of the formation, where the race of shells is in its youth, lines of ornamentation might appear as solid lines. As the race neared its middle age, these lines would become constricted, and even broken. Or they might, still later, appear as isolated dots, but still showing the orderly arrangement as in a line. Toward the extreme old age, even the line is lost, and these dots waver until no straight lines are noticeable.

Decreasing metabolism in the race is also apparent in the ease with which injuries to the individual animals are repaired, Dr. Fenton has found. Thus in the early youth of the race, injuries received while the shell is small may be so completely and quickly repaired that they are scarcely noticeable in the older animal.

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FIRST GLANCES AT NEW BOOKS

IMMIGRATION AND RACE ATTITUDES—Emory S. Bogardus—*Heath* (\$1.80). No matter to what section of the United States we turn, we find that a major racial problem stares us in the face. The problem presented by the fact that a third of the population of the United States consists of foreign-born or those of foreign or mixed parentage, is treated through the use of the case method. Through the text that treats of race attitudes there are many readable and concrete examples of antipathies and conflicts with other peoples within our doors.

Social Sciences
Science News-Letter, January 11, 1930

FROM SANDY HOOK TO 62°—Charles Edward Russell—*Century* (\$3.50). Thrilling tales with a deep-sea twang, being the record of the New York Harbor pilot boat that has made the channel safe for ocean ships for over a century.

Navigation
Science News-Letter, January 11, 1930

CHICAGO: AN EXPERIMENT IN SOCIAL SCIENCE RESEARCH—T. V. Smith and Leonard D. White—*The University of Chicago Press* (\$3). Chicago, favored with attention from literary and journalistic circles in recent months, is now dissected by sociologists. The issue of this study coincides with the dedication of the new Social Science Research Building of the University of Chicago.

Sociology
Science News-Letter, January 11, 1930

HOW TO GROW ROSES—Robert Pyle, J. Horace McFarland and G. A. Stevens—*Macmillan* (\$2). That this book now enters its seventeenth edition would seem sufficient guaranty of quality and interest. Those who know roses know also the authority borne by the names of the authors.

Floriculture
Science News-Letter, January 11, 1930

TEXTILE FIBERS, YARNS AND FABRICS—Helen A. Bray—*Century* (\$2.50). To make girls and women more competent purchasers and users of fabrics and textiles is the avowed purpose of this textbook. Here may be found pertinent information on fibers, yarns, fabrics and the chemical tests used in manufacture and testing.

Chemistry—Home Economics
Science News-Letter, January 11, 1930

WOMEN IN GAINFUL OCCUPATIONS—Joseph A. Hill—*Government Printing Office* (\$1.50). The phenomenon of the working woman, not altogether the growth of the years of this century, is considered statistically in this United States Census Monograph.

Sociology
Science News-Letter, January 11, 1930

ELECTRICAL UTILITIES: THE CRISIS IN PUBLIC CONTROL—Wm. E. Mosher and Others—*Harper* (\$4). A sociological consideration of one of the most controversial subjects in politics and industry today.

Sociology
Science News-Letter, January 11, 1930

THE ST. LAWRENCE NAVIGATION AND POWER PROJECT—H. G. Moulton, C. S. Morgan, and A. L. Lee—*Brookings Institution* (\$4). This searching inquiry into the St. Lawrence project, estimated at a cost of \$999,000,000, proves that the proposed twenty-seven-foot waterway cannot be justified on economic ground. The inclusive cost to taxpayers and shippers would be greater than present transportation charges. The report and its voluminous appendices, contained in a compact form, is a major contribution to the economics of American waterways.

Economics
Science News-Letter, January 11, 1930

MODERN AVIATION ENGINES—Victor W. Pagé—*Henley* (\$9 set). Encyclopedic in content, these two volumes will be of great interest to anyone who services, tends, utilizes or studies the power plant that drives the ships of the air.

Aviation—Mechanical Engineering
Science News-Letter, January 11, 1930

MEN AND MACHINES—Stuart Chase—*Macmillan* (\$2.50). An illuminating consideration of the various ramifications of the machine age. Mr. Chase's analysis is thrilling and at times is somewhat despairing.

Sociology
Science News-Letter, January 11, 1930

EARNINGS OF FACTORY WORKERS—Census Bureau—*Government Printing Office* (\$1.50). The Census Bureau's monograph on the subject of wages earned since the turn of the century.

Economics
Science News-Letter, January 11, 1930

THE NATURE AND PROPERTIES OF SOILS—T. L. Lyon and H. O. Buckman—*Macmillan* (\$3.50). A revised edition of a standard and successful textbook of edaphology for colleges.

Soil Science
Science News-Letter, December 21, 1929

ORGANIC AND FOOD CHEMISTRY—H. E. Culver and T. A. Rogers—*Blakiston* (\$1.50). A condensed textbook for use in home economics course.

Chemistry
Science News-Letter, December 14, 1929

STUDIES ON SCURVY—A. W. Meyer and L. M. McCormick—*Stanford University Press* (paper, \$1.50; cloth, \$2.25). A valuable account of studies of experimental scurvy in the guinea pig. Not of interest to the general reader, however.

Medicine
Science News-Letter, January 11, 1930

EXPERIMENTAL PHYSICAL CHEMISTRY—Farrington Daniels, J. Howard Mathews and John Warren Williams—*McGraw-Hill* (\$3.50). In this laboratory manual, the authors endeavor, among other things, to train the student for research.

Chemistry
Science News-Letter, January 11, 1930

HEALTH AND SAFETY—Frances Gulick Jewett—*Ginn and Co.* (\$0.68). An old fashioned little book for very small persons. While the facts given in this child's text of hygiene have been brought up-to-date in this edition, some of the illustrations, both pictorial and verbal, may not impress the sophisticated youngsters of today as successfully as they did the children of 25 years ago.

Hygiene
Science News-Letter, January 11, 1930

KINGS OF COMMERCE—T. C. Bridges and H. H. Tiltman—*Crowell* (\$3). The Horatio Alger stories of modern business men of Great Britain and America, written from a British viewpoint.

Biography
Science News-Letter, January 11, 1930

OPPORTUNITIES IN AVIATION—Walter Hinton—*Norton* (\$3). Aviation has become such an industry that it occupies a whole book to tell of the opportunities that are open in this new field of human endeavor.

Aviation
Science News-Letter, January 11, 1930